आज़ादी का अमृत महोत्सव
आज़ादी के 75 वर्ष

DRDO
NEWSLETTER

A Monthly Bulletin of Defence Research and Development Organisation

ISSN: 0971-4391

www.drdo.gov.in

AUGUST 2021 | VOLUME 41 | ISSUE 8

DRDO SUCCESSFULLY FLIGHT-TESTS SURFACE-TO-AIR MISSILE AKASH-NG

CONTENTS

AUGUST 2021
VOLUME 41 | ISSUE 8
ISSN: 0971-4391

41st Year of Publication

Editor-in-Chief: Dr Alka Suri
Associate Editor-in-Chief: Sunil Dhar
Managing Editor: Nishant Kumar

Editor: Dipti Arora
Editorial Assistance: Biak Tangpua, Raj Kumar

Printing: SK Gupta
Distribution: Tapesh Sinha

Website: https://www.drdo.gov.in/drdo/pub/newsletter/

Please mail your feedback at:
director@desidoc.drdo.in

Contact at: 011-23902403; 23902472
Fax: 011-23819151

LOCAL CORRESPONDENTS

Ahmadnagar: Col Atul Apte, Shri. RA Shaikh, Vehicle Research and Development Establishment (VRDE); **Ambernath:** Dr Susan Titus, Naval Materials Research Laboratory (NMRL); **Chandipur:** Shri PN Panda, Integrated Test Range (ITR); Shri Ratnakar S. Mohapatra, Proof & Experimental Establishment (PXE); **Bengaluru:** Shri Satpal Singh Tomar, Aeronautical Development Establishment (ADE); Smt MR Bhuvaneswari, Centre for Airborne Systems (CABS); Smt Faheema AGJ, Centre for Artificial Intelligence & Robotics (CAIR); Ms Tripty Rani Bose, Centre for Military Airworthiness & Certification (CEMILAC); Smt Josephine Nirmala M, Defence Avionics Research Establishment (DARE); Smt Anuya Venkatesh, Defence Bioengineering & Electromedical Laboratory (DEBEL); Shri Venkatesh Prabhu, Electronics & Radar Development Establishment (LRDE); Dr Vishal Kesari, Microwave Tube Research & Development Centre (MTRDC); **Chandigarh:** Dr HS Gusain, Snow & Avalanche Study Establishment (SASE); Dr Prince Sharma, Terminal Ballistics Research Laboratory (TBRL); **Chennai:** Smt S Jayasudha, Combat Vehicles Research & Development Establishment (CVRDE); **Dehradun:** Shri Abhai Mishra, Defence Electronics Applications Laboratory (DEAL); Shri JP Singh, Instruments Research & Development Establishment (IRDE); **Delhi:** Shri Ashutosh Bhatnagar, Centre for Personnel Talent Management (CEPTAM); Dr Dipti Prasad, Defence Institute of Physiology & Allied Sciences (DIPAS); Dr Nidhi Maheshwari, Defence Institute of Psychological Research (DIPR); Shri Navin Soni, Institute of Nuclear Medicine and Allied Sciences (INMAS); Smt. Rabita Devi, Institute for Systems Studies & Analyses (ISSA); Ms Noopur Shrotriya, Scientific Analysis Group (SAG); Dr Rupesh Kumar Chaubey, Solid State Physics Laboratory (SSPL); **Gwalior:** Dr Manorama Vimal, Defence R & D Establishment (DRDE); **Haldwani:** Dr Atul Grover, Defence Institute of Bio-Energy Research (DIBER); **Hyderabad:** Shri Hemant Kumar, Advanced Systems Laboratory (ASL); Shri Pramod K Jha, Centre for Advanced Systems (CAS); Dr JK Rai, Advanced Numerical Research & Analysis Group (ANURAG); Ms Bidisha Lahiri, Centre for High Energy Systems & Sciences (CHESS); Shri ARC Murthy, Defence Electronics Research Laboratory (DLRL); Dr Manoj Kumar Jain, Defence Metallurgical Research Laboratory (DMRL); Dr K Nageswara Rao, Defence Research & Development Laboratory (DRDL); Shri Lalith Shankar, Research Centre Imarat (RCI); **Jagdalpur:** Dr Gaurav Agnihotri, SF Complex (SFC); **Jodhpur:** Shri Ravindra Kumar, Defence Laboratory (DL); **Kanpur:** Shri AK Singh, Defence Materials & Stores Research & Development Establishment (DMSRDE); **Kochi:** Smt Letha MM, Naval Physical & Oceanographic Laboratory (NPOL); **Leh:** Dr Dorjey Angchok, Defence Institute of High Altitude Research (DIHAR); **Mussoorie:** Dr Gopa B Choudhury, Institute of Technology Management (ITM); **Mysuru:** Dr M Palmurugan, Defence Food Research Laboratory (DFRL); **Pune:** Dr (Mrs) JA Kanetkar, Armament Research and Development Establishment (ARDE); Dr Vijay Pattar, Defence Institute of Advanced Technology (DIAT); Shri SS Arole, Research & Development Establishment (Engrs) [R&DE (E)]; **Tezpur:** Dr Jayshree Das, Defence Research Laboratory (DRL)

DRDO SUCCESSFULLY FLIGHT-TESTS SURFACE-TO-AIR MISSILE AKASH-NG

Defence Research & Development Organisation (DRDO) successfully flight-tested the New Generation Akash Missile (Akash-NG), a surface-to-air missile from Integrated Test Range (ITR) off the coast of Odisha on 21 July 2021. The flight trial was conducted from a land-based platform with all weapon system elements such as multifunction radar, command, control & communication system and launcher participating in deployment configuration.

The missile system has been developed by Defence Research & Development Laboratory (DRDL), Hyderabad in collaboration with other DRDO laboratories. The launch was witnessed by the representatives of Indian Air Force (IAF).

To capture flight data, ITR deployed a number of range stations like, electro-optical tracking system, radar and telemetry. The flawless performance of the entire weapon system has been confirmed by complete flight data captured by these systems. During the test, the missile demonstrated high manoeuvrability required for neutralising fast and agile aerial threats.

Once deployed, the Akash-NG weapon system will prove to be a force-multiplier for the air defence capability of the IAF. Production agencies-Bharat Electronics Limited (BEL) and Bharat Dynamics Limited (BDL) also participated in the trials.

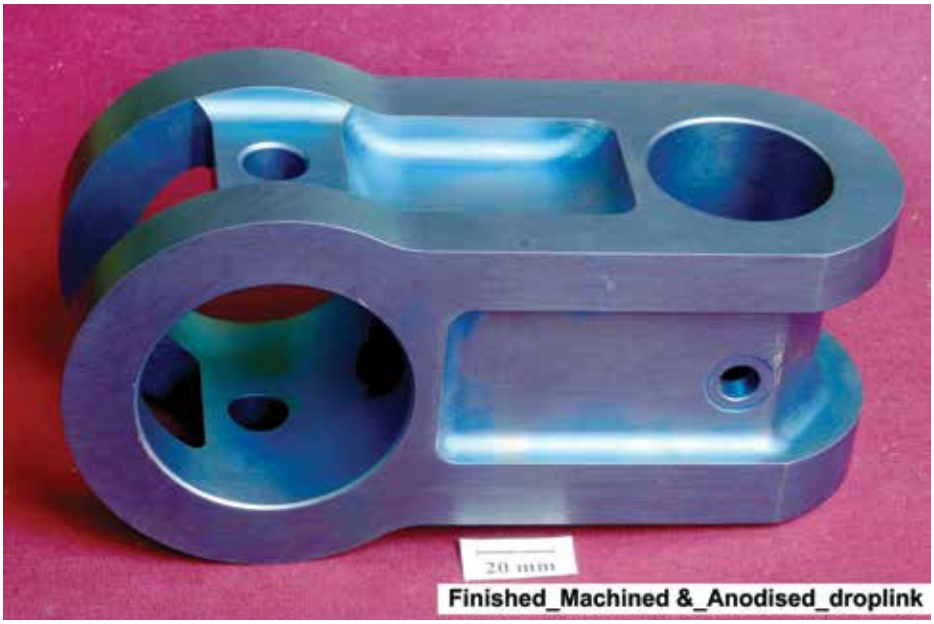
Raksha Mantri Shri Rajnath Singh congratulated DRDO, BDL, BEL, Indian Air Force and the industry for the successful test. Secretary Department of Defence R&D and Chairman DRDO applauded the efforts of the team and said the missile will strengthen the IAF.

- New generation surface-to-air missile
- High manoeuvrability to neutralise aerial threats
- Boost-to-air defence capabilities of Indian Air Force
- Raksha Mantri congratulates DRDO

DRDO INDIGENOUSLY DEVELOPS HIGH STRENGTH BETA TITANIUM ALLOY ON INDUSTRIAL SCALE

Defence Research and Development Organisation (DRDO) has indigenously developed a high strength metastable beta titanium alloy containing vanadium, iron and aluminium, Ti-10V-2Fe-3Al on an industrial scale for applications in aerospace structural forgings. The alloy has been developed by Defence Metallurgical Research Laboratory (DMRL), a premier Hyderabad-based laboratory of DRDO. These alloys are already being used by many developed nations in recent times as a beneficial substitute for the relatively heavier traditional Ni-Cr-Mo structural steels to achieve weight savings. The excellent forge ability of high strength-to-weight ratio Ti-10V-2Fe-3Al alloy facilitates the manufacture of intricately configured components for aerospace applications with the potential for significant weight savings. Some of the components which may be forged from this alloy include slat/flap tracks, landing gear and drop link in landing gear –among several others. The high-strength beta titanium alloys are unique due to their higher strength, ductility, fatigue, and fracture toughness – making them increasingly attractive for aircraft structural applications. Furthermore, their relatively lower lifetime cost, owing to superior corrosion resistance in comparison to steel, is an effective trade-off to justify the use of this expensive material in India too.

The DMRL has carried out raw material selection, alloy melting, thermo-mechanical processing, ultrasonics-based Non-Destructive Evaluation (NDE), heat treatment, mechanical characterisation, and type certification in active collaboration with several agencies. Aeronautical Development Agency (ADA) has identified over 15 steel components that may be replaced by Ti-10V-2Fe-3Al alloy forgings shortly with a potential of 40 per cent weight savings. The landing gear drop link is the first component forged successfully by ADA at HAL, Bengaluru with DMRL's involvement and duly certified for airworthiness. Raksha Mantri Shri Rajnath Singh congratulated DRDO and the industry for the indigenous development of high strength metastable beta titanium alloy which will be useful for aerospace structural forgings. Secretary, Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy applauded the dedicated efforts by the teams involved in the indigenous development of the technology.



Finished_Machined &_Anodised_droplink

Forged_bars of_Ti1023_Midhani_Mod_with Mark3

DRDO'S SHORT SPAN BRIDGING SYSTEM-10 M INDUCTED INTO INDIAN ARMY

The first production lot of 12 Short Span Bridging System (SSBS)-10 m, designed and developed by DRDO has been inducted into the Indian Army by Chief of the Army Staff General MM Naravane during a ceremony held at Cariappa Parade Ground, Delhi Cantt. on 2 July 2021. Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy was present on the occasion. The SSBS-10 m plays a crucial role in bridging the gaps up to 9.5 m as a single span providing a 4 m wide, fully decked roadway, ensuring faster movement of the troops. Research & Development Establishment (Engrs) Pune, a premier engineering laboratory of DRDO, has designed and developed the system in association with M/s L&T Ltd. The 12 bridges are part of 102 SSBS-10 m from M/s L&T Ltd, which is the production agency. The system involved the development of two prototypes of 5 m SSBS on Tatra 6x6 chassis and another two prototypes of 10 m SSBS on Tatra 8x8 re-engineered chassis. Both the systems have undergone rigorous trials from Directorate General of Quality Assurance (DGQA), MET and User trials. After successful completion of all the trials, the systems were recommended for induction into the Services. The bridging system is compatible with Sarvatra Bridging System (75 m), where the last span requires covering gaps less than 9.5 m. The deployed bridge is of the load classification of MLC 70. The system will help in the quick movement of troops and enhance the mobilisation of resources. The DRDO has vast experience in developing critical combat engineering systems like military bridging systems. Several mechanised mobility solutions for the Indian Army like Single Span 5 m and 10 m, Short Span Bridging System, 46 m Modular Bridge, 20 m BLT-T72 and Multi-Span 75 m Sarvatra Bridging System, etc. have been developed. Manually launched 34.5 m Mountain Foot Bridge was also developed by DRDO earlier. These bridges have been widely accepted by the Indian Army. Raksha Mantri Shri Rajnath Singh congratulated DRDO, the Indian Army and the Industry on the successful development and induction of the system.

He stated that this induction will give a boost to the fast-growing Indian defence industrial ecosystem and help the industry to contribute towards 'Atmanirbhar Bharat'. Chairman DRDO Dr G Satheesh Reddy congratulated the teams involved in the successful development and induction of this bridging system into the Indian Army.

DRDO SUCCESSFULLY FLIGHT TESTS NEW GENERATION AGNI P BALLISTIC MISSILE

DRDO successfully flight tested a new generation nuclear-capable ballistic missile Agni P from Dr APJ Abdul Kalam island off the coast of Odisha, Balasore on 28 June 2021. Various telemetry and radar stations positioned along the eastern coast tracked and monitored the missile. The missile followed textbook trajectory, meeting all the mission objectives with a high level of accuracy. Agni P is a new generation advanced variant of the Agni class of missiles. It is a canisters missile with a range capability between 1,000 km and 2,000 km.

DRDO SUCCESSFULLY TEST FIRES ENHANCED RANGE 122 MM CALIBER ROCKET

DRDO successfully test-fired enhanced range versions of indigenously developed 122 mm Caliber Rocket from a Multi-Barrel Rocket Launcher (MBRL) on June 25, 2021, at Integrated Test Range (ITR), Chandipur off the coast of Odisha. Four enhanced range versions of 122 mm rockets were test-fired with full instrumentation and they met the complete mission objectives. These rockets have been developed for army applications and can destroy targets up to 40 km. All the flight articles were tracked by range instruments, including telemetry, radar and electro-optical tracking systems deployed by ITR and Proof and Experimental Establishment (PXE). The rocket systems have been developed jointly by Pune-based Armament Research and Development Establishment (ARDE) and High Energy Materials Research Laboratory (HEMRL) with manufacturing support from M/s Economic Explosives Limited, Nagpur. The enhanced rocket system would replace the existing 122 mm Grad rockets. Raksha Mantri Shri Rajnath Singh congratulated DRDO and the industry on the successful launch of 122 mm Caliber Rocket. Secretary, Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy commended the efforts of the teams involved in successful trials.

DMRL DEVELOPS ADVANCED MATERIALS FOR HIGH POWER MICROWAVE DEVICES IN DEFENCE APPLICATIONS

Defence Metallurgical Research Laboratory (DMRL), Hyderabad has recently developed advanced ceramic materials for critical electronic components for applications in DRDO, together with a strong potential for use in other areas of technology verticals. There are only limited sources world over for these materials catering to the indigenous development of Coupled Cavity Travelling Wave Tube (CCTWT) and microwave power modules for applications in various Air and Surface Surveillance Radars, Electronic Warfare Systems (EWS), missile seeker and energy weapon systems for defence applications. The uncertainty in the availability of these strategic materials has only increased during recent years, with the overseas firms often delaying or denying supplies. Therefore, DMRL has taken up focused research and indigenous development of lossy ceramics, high conductive substrates and ferroelectric cathodes essential for the production of microwave devices by MTRDC, BEL and others. DMRL actively collaborated with MTRDC to successfully fabricate several components such as AlN-SiC sever buttons with required dielectrics for G band CCTWT, AlN high conductive substrates for electronic devices, MgO-SiC lossy sticks for G band microwave tubes, Ferroelectric PLZT cathodes for high power Directed Energy Weapons (DEW) with high dielectric permittivity and zero charges coefficient, and so on – just to name a few. All the components were made and supplied by DMRL as per the requirements through a hot pressing process followed by machining as necessary, duly optimizing the process parameters. The materials acquired the required dielectrics to withstand ultra-high vacuum and temperature. The high conductive AlN substrates were imparted high electrical insulation, dielectric strength and high thermal conductivity. The process also facilitated the making of fully dense thicker substrates (>2.5 mm) for other applications. The bonding of copper foil to the substrate was done, adopting both direct bonding as well as active metal brazing techniques (on one or both sides). PLZT ferroelectric cathodes were made through solid-state synthesis and sintering with a high dielectric constant.

DIPAS SIGNS MOU WITH JNU

An MoU was signed between Jawaharlal Nehru University (JNU) and Defence Institute of Physiology and Allied Sciences (DIPAS) for collaboration in education and research. The MoU was signed by Dr Rajeev Varshney, Director, DIPAS and Prof M Jagadesh Kumar, Vice-Chancellor, JNU in the presence of scientists, faculty and office bearers of both the institutions. Dr Varshney highlighted the unique core competence and research capabilities existing at DIPAS in areas of extreme environment physiology, soldier health and performance, nutrigenomics, medical informatics, drug development, biomedical instrumentation and ergonomics, human-machine interfaces that have translated to customised deliverables for improving combat efficiency of troops deployed in extreme operational environments. Prof Kumar said that the signing of the MoU is an important milestone in fostering bilateral collaboration between both the institutes and emphasised that the cooperation will focus

on joint research activities, faculty and student exchange programmes and incubating technologies at Atal Incubation Centre, JNU. Both institutions will explore opportunities for interaction among faculty and students between schools/ centres of JNU and DIPAS. While JNU has strength in fundamental research in life sciences and biomedical fields, DIPAS is a pioneer in the area of applied research in military physiology, ergonomics and soldier health and assistive technologies in the country. The MoU will not only create new prospects for research but also contribute towards nurturing young scientific talents through enrolment in PhD programmes and providing them exposure to both basic and applied aspects providing sustainable solutions in extreme operational environments.

INTERNATIONAL YOGA DAY CELEBRATIONS

DLRL, HYERABAD

International Yoga Day (IYD) was celebrated in Defence Electronics Research Laboratory (DLRL) on 21 June 2021 in a virtual mode with the theme "Be with Yoga, Be at Home". The Chief Guest for the occasion was Mr Hasan Tafti, Senior Yoga Corporate faculty, Meditation Teacher, Yoga Fitness and well-being trainer with the *Art of Living*. Shri RV Haraprasad, OS, Associate Director DLRL welcomed all the participants and briefed them about the importance of yoga in day-to-day life, and its relevance during the present pandemic season. Shri SR Pankaj Kumar, Sc 'G', Chairman, Works Committee gave a brief introduction about DLRL charter of duties, Vision and Mission. Smt Lakshmi, Sc 'F', Chairperson S&T introduced the Speaker to all the participants. Yoga Guru Hasan Tafti, talk on "Yoga & Meditation" was inspiring. He conducted a yoga session and made people feel at ease. Participants have thoroughly enjoyed theprogramme. The programme concluded with a vote of thanks by Chairman, Works Committee.

NPOL, KOCHI

The United Nations theme for the International Day of Yoga this year is "Yoga for Well-being". This theme of holistic well-being is most relevant at present when the COVID-19 pandemic continues to unsettle the lives and livelihood of every individual. Naval Physical and Oceanographic Laboratory (NPOL) celebrated the day by spreading the message of yoga in promoting the physical and mental well-being of humanity. Posters were displayed prominently and employees were encouraged to practice yoga at home with the participation of family members.

The employees were encouraged to participate in the lYD-2021 celebrations through digital, virtual and electronic platforms. Employees participated enthusiastically by doing the common yoga protocol at home along with their families on 21 June 202l. They also participated in the yoga activities organised by the M/o AYUSH on MyGov Platform (http://rvww.mygov.in). Employees were also encouraged to join the daily virtual yoga training sessions offered by the Morarji Desai National Institute of Yoga under M/o AYUSH.

VAN MAHOTSAV CELEBRATION

DRDO HQ, DELHI

To create awareness about environmental issues as well as to encourage participation in environment protection, DRDO HQ celebrated Van Mahotsav on 7 July 2021. Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy inaugurated the programme and planted a sapling in the complex. Director General (HR), Director General (TM), Director General (R&M) and DCWE participated in the programme and planted saplings.

DESIDOC, DELHI

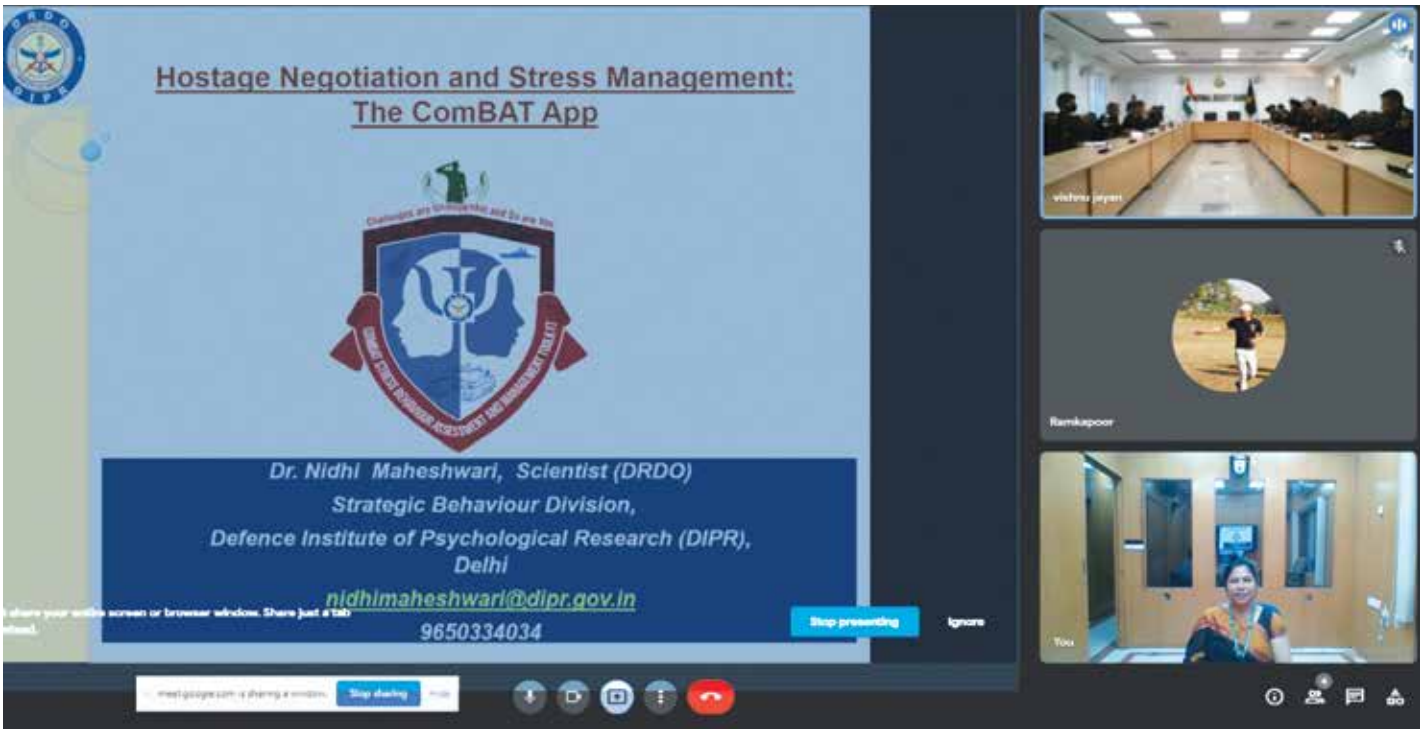
DESIDOC organised a tree plantation programme on 17 July 2021 at Metcalfe House, Delhi as a part of Van Mahotsav celebration. The programme was inaugurated by Dr Alka Suri, Director DESIDOC, followed by her words about the importance of the occasion and the need of planting trees for saving the environment. Approx. 100 saplings were planted by employees of DESIDOC. The occasion made the employees aware about their responsibility towards environment and the Mother Nature.
Dr Rajeev Vij, Associate Director coordinated the event.

WEBINAR ON COMBAT APP FOR THE INDIAN ARMY

Defence Institute of Psychological Research (DIPR), Delhi conducted a two-day webinar from 7 to 8 July 2021 on Combat Stress Management for the SATA Regiment of the Indian Army. Hands-on training on both the applications, named ComBAT and ComBAT Active, was given to a group of 150 armed forces personnel including officers, JCOs and Jawans at the regimental level.

WEBINAR ON HOSTAGE NEGOTIATION FOR NATIONAL SECURITY GUARDS

Defence Institute of Psychological Research (DIPR), Delhi organized a one-day webinar on 5 July 2021 on the topic of Hostage Negotiation and Stress Management for the elite force of National Security Guards (NSG), Hostage Negotiation Course No-09. Officers and men from various security forces including SSB, BSF and Indian Army participated in this webinar. They were trained upon the various techniques of Hostage negotiation as well as the ComBAT apps developed by DIPR.



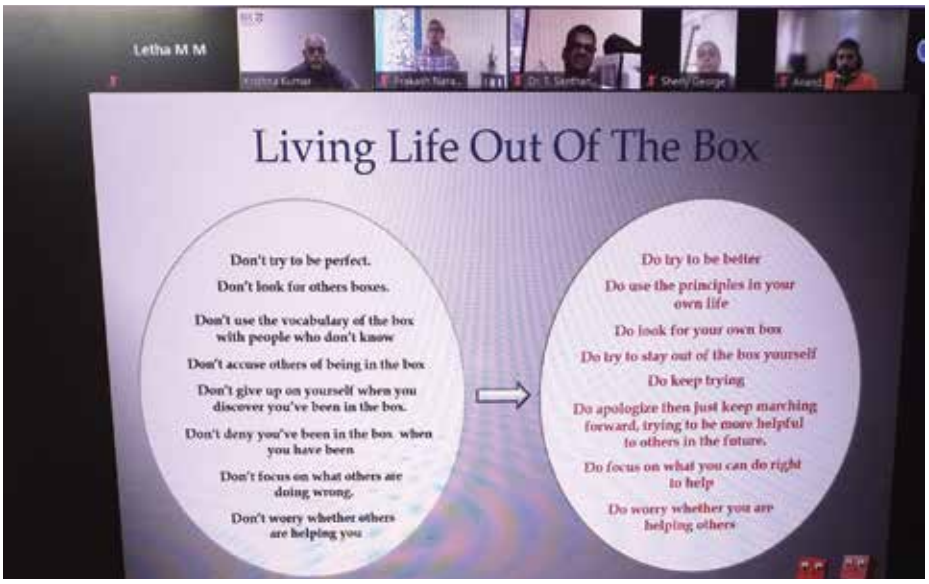
COMBAT APP ONLINE TRAINING PROGRAMME FOR INSTITUTE OF NATIONAL INTEGRATION

Defence Institute of Psychological Research (DIPR), Delhi conducted an online training programme on ComBAT App for the RRT-89 batch of Institute of National Integration (INI), Pune on 15 and 16 June 2021. Recruit Religious teachers (RRTs) of Indian Army were trained by DIPR scientists on various techniques, assessment and activities of ComBAT App for optimal stress management of soldiers in their respective units.

ONLINE TARGETED TRAINING ON ALIGNING FOR SELF EXCELLENCE

Naval Physical & Oceanographic Laboratory (NPOL), Kochi organized a three-day online targeted training on 'Aligning for Self Excellence' for the benefit of all Division Heads of NPOL. The objective of the course is to inculcate a transformational mindset that would enable them

to lead their respective divisions more effectively, in alignment with the organizational goals. The programme covered the key competencies necessary for the 21st century leader to deliver high performance. It also covered the broader areas of emotional intelligence, critical thinking and collaboration. Prof Krishna Kumar, Master Coach, intrad school of executive coaching (ISEC) and guest faculty, IIM Bangalore was the resource person for this targeted training programme.



TRAINING ON GIS TECHNOLOGY

The scientists of Institute for Systems Studies & Analyses (ISSA) and Centre For Air Borne System (CABS) underwent training on CAIR GIS (Indigenous GIS developed by CAIR) from 5 to 7 April 2021. The training involves usage, visualization, analysis and measurement using CAIRGIS technology. How to use the 2D and 3D visual functionalities and features of CAIR GIS technology was imparted with examples. In addition to this hands-on training on customization and integration of various features and functionalities of CAIR GIS was imparted.

Director, CAIR handed over the SDK for CAIR GIS along with the user manual, programmers manual and example programs for use in their projects of CABS and ISSA.

APPOINTMENT

DIRECTOR GENERAL, MSS

Dr BHVS Narayana Murthy, Distinguished Scientist and Director, RCI has been appointed as DG, MSS, DRDO, Hyderabad. Dr Murthy is a distinguished scientist and renowned for his R&D in the indigenous design & development of advanced avionics technologies for defence and aerospace applications in India. As Director and Programme Director, he spearheaded Research Centre Imarat (RCI), an avionics laboratory of Dr APJ Abdul Kalam Missile Complex steering the design, development and delivery of avionics and wide range of missiles and guided weapon systems. He graduated in Electronics and Communication Engineering from REC, Warangal, completed his M.Tech from JNTU, Hyderabad and received Ph.D in Computer Science from IIIT, Hyderabad. He joined DRDO in the year 1986.

Dr Murthy is the Chief Architect of Advanced Onboard Computer (OBC) technologies for missile systems and other defence applications. His sustained contributions and technology leadership over the last three decades has been transformative for making India self-reliant in advanced real-time embedded computers, mission computing systems and other avionics technologies. He led the design and development of advanced avionics for "Mission Shakti," India's first Anti Satellite Missile Test (A-SAT) and Long Range Missile Agni 5, elevating India into a league of select nations and strengthening indigenous defence capabilities. He played a vital role in the successful development and demonstration of avionics systems for BVRAAM Astra, QRSAM, Akash1S, Akash NG, HSTDV, NGARM, Long Range Guided Bombs, BrahMos, ATGM Nag, HELINA, MPATGM, SANT, BMD, ANSP, Agni series of missiles and other guided weapon systems. As Project Director, he led the conceptualisation, design and development of the Smart Anti-Airfield Weapon (SAAW) and laid foundation for Long Range Smart Guided systems with precision strike capabilities. As an On-board computer specialist and Technology Director, Dr Murthy significantly contributed in conceptualisation, planning, design, development of advanced real-time computer technologies for various missiles, fighter aircrafts and for other strategic applications. He architected the development and production of single chip mission computer, System-on-Chip, and Integrated Avionics Module (IAM) bringing in quantum jump in miniaturisation of On-board avionics for futuristic miniaturised smart weapon systems. His R&D contributions had a major impact on the indigenisation of critical aerospace and missile technologies. For his distinguished contributions, he has been conferred with Honorary Fellowship of Computer Society of India, elected as Fellow of the Indian National Academy of Engineering (INAE) and Indian Society of Systems for Science and Engineering. Other prestigious awards conferred on Dr Murthy includes Rocket and Related Technologies Award by the Astronautical Society of India, Agni Award for Excellence in Self-Reliance, DRDO Scientist of the Year Award, Path Breaking Research/Outstanding Technology Development Award and DRDO Performance Excellence Award.

DIRECTOR, R&DE(E)

Shri PM Kurulkar, OS has taken over as Director of Research & Development Establishment (Engineers) [R&DE(E)] on 1 June 2021.

Shri Kurulkar joined DRDO at CVRDE, Avadi, in 1988 after completing his Bachelor's degree in Electrical Engineering from COEP Pune in 1985 in first class with Distinction. He further completed his advanced courses in Power Electronics from IIT Kanpur with a specialisation in drives and application. His area of specialisation is Design and Development of Missile Launchers, Military Engineering Equipment, Advanced Robotics and Mobile Unmanned Systems for Military Applications.

As Project Leader and System Manager for Akash Ground Systems, he has been a key

member of the Akash team and has played a major role in the design, development and production of Akash Launchers and mission-critical Ground Systems. As a Project Director SF, Agni Project, he steered the design and development of Road & Rail versions of Launchers & Ground systems. Shri Kurulkar, as a Team Leader and Lead Designer, has played a major and pioneering role in the successful design, development and delivery of several Military Engineering Systems and Equipment including Missile Launchers for Programme AD, MRSAM, Nirbhay Subsonic Cruise Missile System, Prahar, QRSAM, XRSAM, Hyperbaric Chamber and Mobile Power Supply and High-Pressure Pneumatic Systems. On March 27, 2019, DRDO successfully conducted Mission Shakti, an anti-satellite missile test. The critical subsystem of this mission was the design and development of a ballistic missile Launcher from concept to a deployable prototype. The Launcher was developed in a very short time of three months under the able guidance and leadership of Shri Kurulkar, whose innovative execution and management techniques not only made the system ready in advance but also brought laurels to R & DE (Engrs), Pune.

Shri Kurulkar has launched a series of new technological initiatives in the emerging technology areas like – High-Performance High Power Servo Drive Technology, Platform Stabilsation Technology, AFPM based Alternator Technology, VSCF-based Power Source Technology, Electric Propulsion Technology, Missile Canister Technology, and Linear Electric Motor Technology. He has plans to develop dual-use, multi-purpose products and technologies with enhanced civilian application of DRDO products and technologies. He also wants to aggressively pursue the export of successful DRDO developed products, equipment and technologies to friendly foreign countries.

Shri Kurulkar is a recipient of the Science Day Award for Best Publication in 2000, the DRDO Agni Award for Excellence in Self-Reliance in 2002, the DRDO Award for Path-breaking Research/Outstanding Technology development in 2008 for AKASH and the DRDO Award for Performance Excellence for MRSAM in 2016 and the Award for Excellence of Technology by DEMA in 2016.

National Geospatial Award for Excellence

Dr Narayan Panigrahi born on 7 June 1966, obtained his BSc (Physics Hons) from Khallikote college, Odisha (1987), MSc (Computer Science) from JK Institute of Applied Physics and Technology, University of Allahabad (1990), MTech (Computer Science and Data processing) from IIT, Kharagpur (1999) and PhD from Indian Institute of Technology, Bombay started his professional career as a scientist in Institute for System Studies and Analysis (ISSA), DRDO, New Delhi. Currently, he is engaged in the design and development of Indigenous Geo-Spatial solutions for armed forces of the country.

Dr Narayan Panigrahi has pursued the scientific basis of GIS and Remote Sensing over the past two decades through research and development of Indigenous GIS technology. He heads the Geographic Information System Division in Center for Artificial intelligence and Robotics (CAIR) where he led a team of scientists towards successful design, development and implementation of Indigenous Geographical Information System (INDIGIS). The Indigenous GIS technology has been developed to achieve self-reliance and guard the nation against technological denial regimes.

In recognition of his outstanding contributions in the field of geospatial technology as a researcher, academician and professional of high caliber specially in the area of geographic information science and remote sensing applications and promoting the technology inwide spectrum of user community, the Indian society of remote sensing confers the national geospatial award for excellence for the year 2019 on Dr Narayan Panigrahi.

CAIR, BANGULURU

RAdm Sai Venkat Raman, VSM, Commandant – Naval War College visited CAIR on 12 April 2021. There was a briefing by Dr U. K. Singh, OS & Director CAIR, followed by a discussion on CAIR developed technologies in the area of Secure Systems, Command & Control Systems and Intelligent Systems and Robotics.

DIHAR, LEH

Dr G. Satheesh Reddy, Secretary DDR&D and Chairman DRDO, visited Defence Institute of High Altitude Research (DIHAR) from 19 - 23 June 2021. During the stay, he visited various border locations like Siachen Base Camp, Zero RD and Chumathang, where he had 'on ground' interaction with soldiers and the local population. He also celebrated Yoga Day at a forward post along with troops on 21 June 2021 by carrying out Yoga exercises. He was accompanied by Dr. (Smt) Chandrika Kaushik, OS, Director, Dte of Interaction with Services for Business, DRDO and Director DIHAR, Dr OP Chaurasia during these interactions.

On 23 June 2021, Chairman DRDO also interacted with the Honb'le Lt Governor of Ladakh, Shri Radha K Mathur at Raj Bhawan. The Lt Governor appreciated the role played by DIHAR in combating the Covid-19 pandemic specifically in monitoring the spread of this virus. Shri Mathur was also appreciative of the Agro-animal research carried out by DIHAR and applauded the role of DIHAR in the overall development of local economy of this landlocked region.

During his stay at DIHAR, the Chairman DRDO also reviewed the R&D projects being carried out and suggested novel endeavours to be taken up by DIHAR in future in align with the emerging requirements of the organization.

DIPR, DELHI

Maj. Gen. Rajiv Nanda, Offg DG Recruiting visited Defence Institute of Psychological Research (DIPR) on 24 June 2021. He was accompanied by Brig Manish Arora, ADG Rtg and Col M D S Duggal, Director Rtg 'A'.

Dr K Ramachandran, Director DIPR, briefed the General Officer about the history and role of DIPR and its importance in the selection procedures of the Armed Forces personnel for various roles.

There was discussion on the various techniques of selection procedures and on further fine-tuning of the procedures follow up studies, etc.